**HIGH PERFORMANCE CONCRETE STRUCTURES**
Effective: August 5, 2002
Revised: September 10, 2003

Description. This work shall consist of the construction of a cast-in-place high performance concrete (HPC) structure, according to the applicable portions of Section 503 of the Standard Specifications. The structural members requiring the use of HPC shall be as shown on the plans.

Mix Design. The mix design criteria for the high performance concrete structure shall meet the requirements of Article 1020.04 for Class MS and SI concrete. However, the high performance concrete structure mix design shall be selected from the following table.

Article 1020.05(b) shall apply, except that no reduction in cement content will be allowed.

| Mix Design | 1* | 2* |
|---|---|---|
| Cement | 264 (445) | 264 (445) |
| Class C Fly Ash | 53 (90) | 53 (90) |
| Microsilica Solids | 15 (25) | -- |
| HRM** | -- | 16 (27) |
| Mortar Factor | 0.83 – 0.86 | 0.83 – 0.86 |
| W/C Ratio | 0.38 – 0.44 | 0.38 – 0.44 |

| Mix Design | 3* | 4* |
|---|---|---|
| Cement | 264 (445) | 264 (445) |
| GGBF Slag*** | 53 (90) | 53 (90) |
| Microsilica Solids | 15 (25) | -- |
| HRM | -- | 16 (27) |
| Mortar Factor | 0.83 – 0.86 | 0.83 – 0.86 |
| W/C Ratio | 0.38 – 0.44 | 0.38 – 0.44 |

| Mix Design | 5* | 6* |
|---|---|---|
| Cement | 323 (545) | 323 (545) |
| Microsilica Solids | 15 (25) | -- |
| HRM | -- | 16 (27) |
| Mortar Factor | 0.83 – 0.86 | 0.83 – 0.86 |
| W/C Ratio | 0.38 – 0.44 | 0.38 – 0.44 |

*All weights in $kg/m^3$ ($lbs./yd.^3$)
**HRM – High Reactivity Metakaolin
***GGBF Slag – Ground Granulated Blast-Furnace Slag

Mixing. The mixing requirements shall be according to Article 1020.11(d), except as follows:

(a) Water-based microsilica slurry:

(1) Truck Mixer:

- Combine simultaneously air entraining admixture, water-reducing admixture and/or retarding admixture, microsilica slurry and 80% of the water with cement, fly ash or ground granulated blast-furnace slag (if used), and aggregates.
- Add remaining water.
- Mix 30-40 revolutions at 12-15 RPM.
- Add high range water-reducing admixture.
- Mix 60-70 revolutions at 12-15 RPM.

(2) Stationary Mixer:

- The microsilica slurry shall be diluted into the water stream or weigh box prior to adding into mixer. Combine simultaneously air entraining admixture, water-reducing admixture and/or retarding admixture, microsilica slurry and 80% of the water with cement, fly ash or ground granulated blast-furnace slag (if used), and aggregates.
- Add remaining water.
- After mixing cycle is completed deposit into truck mixer.
- Add high range water-reducing admixture.
- Mix 60-70 revolutions at 12-15 RPM.

(b) Densified microsilica or high reactivity metakaolin (bulk):

(1) Truck Mixer:

- Same as (a)1 above except the densified microsilica or high reactivity metakaolin shall be added with the cement.

(2) Stationary Mixer:

- Same as (a)2 above except the densified microsilica or high reactivity metakaolin shall be added with the cement.

(c) Densified microsilica (bag):

Bagged microsilica shall be kept dry. No bag or material containing moisture shall be introduced into the concrete mixer.

(1) Truck Mixer:

- Combine air entraining admixture, water–reducing admixture and/or retarding admixture and 80% of the water.
- Add cement, fly ash or ground granulated blast-furnace slag, and aggregates.
- Add remaining water.
- Mix 30-40 revolutions at 12-15 RPM.
- Add microsilica.
- Mix 70-80 revolutions at 12-15 RPM.
- Add high range water-reducing admixture.
- Mix 60-70 revolutions at 12-15 RPM.

(2) Stationary Mixer:

- Combine air entraining admixture, water–reducing admixture and/or retarding admixture and 80% of the water.
- Add cement, fly ash or ground granulated blast-furnace slag, and aggregates.
- Add remaining water.
- After mixing cycle is completed deposit into truck mixer.
- Add microsilica to truck.
- Mix 70-80 revolutions at 12-15 RPM.
- Add high range water-reducing admixture.
- Mix 60-70 revolutions at 12-15 RPM.

(d) Undensified HRM (bag):

Bagged HRM shall be kept dry. No bag or material containing moisture shall be introduced into the concrete mixer.

(1) Truck Mixer:

- Same as (c)1, except the undensified HRM shall be added to the truck.

(2) Stationary Mixer:

- Same as (c)2, except the undensified HRM shall be added to the truck.

Method of Measurement. This work will be measured according to Article 503.21.

Basis of Payment. High performance concrete for cast-in-place structures will be paid for at the contract unit price per cubic meter (cubic yard) for HIGH PERFORMANCE CONCRETE STRUCTURE.